$$Base^{Exponent}$$

Expanding the Factors:
The exponent, ***n***, represent the number of times the base, ***a***, is multiplied by itself.

$$a^n = a * a * a * a * a \qquad \textit{that is } \underline{\boldsymbol{n}} \textit{ factors of the base , } \underline{\boldsymbol{a}}$$

Laws of Exponents

$a^m a^n = a^{(m+n)}$ Product of Powers With Like Bases, Add the Exponents

Ex. $5^2 5^6 = 5^{(2+6)} = 5^8$ $\qquad x^2 x^6 = x^{(2+6)} = x^8$

$\frac{a^m}{a^n} = a^{(m-n)}$ Quotient of Powers $a \neq 0$ With Like Bases, Subtract the Exponents

Ex. $\frac{10^5}{10^3} = 10^{(5-3)} = 10^2$ $\qquad \frac{x^5}{x^3} = x^{(5-3)} = x^2$

$(a^m)^n = a^{mn}$ Power of a Power Multiply the Exponents

Ex. $(5^2)^4 = 5^{2 \cdot 4} = 5^8$ $\qquad (x^2)^4 = x^{2 \cdot 4} = x^8$

$(ab)^n = a^n b^n$ Power of a Product

Recall that x means x^1 then $(a^1 b^1)^n = a^{1 \cdot n} b^{1 \cdot n} = a^n b^n$

$(a^m b^m)^n = a^{n \cdot m} b^{n \cdot m}$ Power of a Product

Ex. $(x^5 y^3)^4 = x^{5 \cdot 4} y^{3 \cdot 4} = x^{20} y^{12}$

$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ Power of a Quotient $b \neq 0$

Ex. $\left(\frac{x}{y}\right)^6 = \frac{x^{1 \cdot 6}}{y^{1 \cdot 6}} = \frac{x^6}{y^6}$

$a^0 = 1$ Zero Exponent

Recall $\frac{a^5}{a^5} = 1$ & the rule "Quotient of Powers" state $\frac{a^5}{a^5} = a^{(5-5)} = a^0$

$a^{-n} = \frac{1}{a^n}$ Negative Exponent $\text{Denominator} \neq 0$

Ex. $x^{-5} = \frac{1}{x^5}$

$\frac{1}{a^{-n}} = a^n$ Negative Exponent $\text{Denominator} \neq 0$

Ex. $\frac{1}{y^{-3}} = y^3$